Svizzero, Michael

From: Gerhard, Sasha
Sent: Friday, January 24, 2014 4:34 PM
To: Svizzero, Michael
Subject: FW: Follow-up to our conversation on Tuesday
Attachments: Entsorga answers to EPA questions dated 11_6_2013.pdf; NRT Letter to EPA re PVC Removal.pdf; NIR Spectroscopy for PVC Removal-1.pdf; SpydIR brochure.pdf

Email for 11/14/13. (Attachments are on G drive.)

From: Faison, George
Sent: Thursday, November 14, 2013 11:43 AM
To: Gerhard, Sasha
Subject: FW: Follow-up to our conversation on Tuesday

George Faison
U.S. Environmental Protection Agency
OSWER, ORCR
1200 Pennsylvania Avenue, NW
Mail Code 5303P
Washington, DC 20460

Phone - (703)305-7652
faison.george@epa.gov

From: Jonathan Birdsong [mailto:jbirdsong@bwstrategies.com]
Sent: Thursday, November 14, 2013 10:22 AM
To: Cozzie, David
Cc: Spells, Charlene; Johnson, Barnes; Faison, George; Armstead, John A.; Devlin, Betsy; Straus, Matt; Smidinger, Betsy; Young, Jessica; Baldwin, Mark; Dubey, Susmita; Carollo, Paolo
Subject: RE: Follow-up to our conversation on Tuesday

David et. al. -

Attached are answers to your questions from 11/6/2013. We are also attaching a letter to Mr. Johnson from the CEO of the NIR manufacturer Entsorga will be using - National Recovery Technologies (NRT). Among other things, this letter discusses a study on NRT's NIR system re: PVC/chlorine extraction from a waste stream. The results of their study showed that by using NRT's NIR equipment, there was only .17% chlorine content remaining.

Again, thanks for your time and consideration. Please contact me if you have further questions or comments.

Sincerely,

Jonathan Birdsong

From: Jonathan Birdsong
Sent: Wednesday, November 13, 2013 1:41 PM
To: Cozzie, David
Cc: Spells, Charlene; Johnson, Barnes; Faison, George; Armstead, John A.; Devlin, Betsy; Straus, Matt; Smidinger, Betsy;

Young, Jessica; Baldwin, Mark; Dubey, Susmita; Carollo, Paolo
Subject: RE: Follow-up to our conversation on Tuesday

David –

So sorry for the delay. We have draft answers to all of your questions and are working with our project partners to provide additional clarity and confirmation for your team. We will get you a final as soon as possible.

Again, sorry for the delay.

Jonathan

From: Cozzie, David [mailto:Cozzie.David@epa.gov]
Sent: Wednesday, November 06, 2013 4:22 PM
To: Jonathan Birdsong
Cc: Spells, Charlene; Johnson, Barnes; Faison, George; Armstead, John A.; Devlin, Betsy; Straus, Matt; Smidinger, Betsy; Young, Jessica; Baldwin, Mark; Dubey, Susmita
Subject: Follow-up to our conversation on Tuesday

Jonathan,

As discussed during our call on Tuesday, below are clarifications of the previously submitted questions to Entsorga by EPA:

1. EPA needs more information about the performance of the proposed NIR system to be used at the West Virginia plant. Is test data available that shows the effectiveness of the proposed NIR system at reducing the chlorine content of the waste which will be processed in West Virginia? *Clarification: Can Entsorga demonstrate/ensure that the chlorine content of the final product will be less than 0.3% and the sulfur content remains at or above a 1:1 stoichiometric ratio with chlorine when combusted?*
2. Can Entsorga regulate the moisture content *of the final product (not the materials exiting the biological treatment step)* to be held at 15% *or less,* consistently? What is the process to keep that consistency?
3. Please confirm the production frequency of the final product (daily or every x days). What are the measures to ensure consistency/homogeneity *of the final product* on a day-to-day and/*or* batch to batch basis? How does Entsorga intend to monitor *the moisture, ash and chlorine content and the chlorine to sulfur ratio of the final product*? The Monitoring and Analysis Plan submitted to EPA on 3/15/2013 appears to be a generic plan with weekly sampling frequencies and analysis frequencies ranging from weekly to four monthly.

In addition, there were some additional clarifying questions raised on the rate of substitution for coal and the types of combustors that would use SRF for which you were seeking approval.

Thanks,

David Cozzie
(919) 541-5356

EPA ADDITIONAL INFORMATION REQUIRED

As discussed during our call on Tuesday, below are clarifications of the previously submitted questions to Entsorga by EPA:

1. EPA needs more information about the performance of the proposed NIR system to be used at the West Virginia plant. Is test data available that shows the effectiveness of the proposed NIR system at reducing the chlorine content of the waste which will be processed in West Virginia? *Clarification: Can Entsorga demonstrate/ensure that the chlorine content of the final product will be less than 0.3% and the sulfur content remains at or above a 1:1 stoichiometric ratio with chlorine when combusted?*

   - The concern about chlorine content refers to the potential formation of dioxin furan. The improvement in lowering chlorine content by using NIR is proven. As mentioned in our October 9, 2013 response, the commercial NIR technology we will use will detect and eject 99% by weight all non-black PVC materials from a waste stream. This technology is proven and in operation in over 15 states across the country including: California, Nevada, Colorado, Texas, Illinois, Georgia, Alabama, Utah, New Mexico, Oklahoma, Arkansas, Wisconsin, Ohio, North Carolina and Rhode Island. Data on the equipment's capabilities are attached. Additionally, most waste which contains chlorine comes from C&I waste. NIR can also detect material which contains chlorine from C&I waste, but that is not what we will be using at the Essroc facility. With the use of the NIR at the Entsorga facility, we can ensure that the final product will have less than a 0.3% chlorine content and the sulfur content will remain at or above a 1:1 stoichiometric ratio with chlorine when combusted.

     It is significant, and worth noting that under 40 CFR Part 63, Subpart LLL, cement manufacturing facilities are required to regularly monitor their facility's emissions to ensure that dioxin furan emissions are not created. Cement manufacturing facilities like Essroc would not be able to operate if dioxin furan emissions exceed this requirement, and Essroc would not consider Entsorga's SRF if there was a threat of violation. Regardless, cement manufacturing facilities not only regularly monitor their emissions, but the facility sets a maximum temperature at the inlet to the control device to curtail dioxin furan formation. In addition, the sulfur content in Entsorga's SRF (that will be used in Essroc's cement plant at a maximum 30% of their total fuel needs) combined with other fuels used by Essroc will make sure that the sulfur content remains at or above a 1:1 stoichiometric ratio with chlorine when combusted, further interfering with dioxin furan formation, and therefore further reducing the possible incidence of dioxin furan emissions. This was also found in an EPA report titled, "Mechanisms of Formation of Dioxin-like Compounds During Combustion of Organic Materials."

     The authors of that report observed that the principal action of sulfur in inhibiting the formation of CDDs/CDFs in combustion systems is through SO_2 depletion of Cl_2, as follows:

     $$Cl_2 + SO_2 + H_2O \rightarrow 2HCl + SO_2$$

     The relevance of this finding is that the co-combustion with coal (that contains sulfur) should lead to dramatic reductions in the potential formation and emission of CDDs/CDFs.

2. Can Entsorga regulate the moisture content *of the final product (not the materials exiting the biological treatment step)* to be held at 15% *or less,* consistently? What is the process to keep that consistency?

   - We can guarantee consistent moisture content in the final material between 15 and 20%. This is the range that was outlined on page 2 of the Waste Management comfort letter dated August 22, 2013.

     Additionally, the water content of the material exiting the biologic area is measured and kept uniform by continuous monitoring of the batches, as the water content of the material after biological treatment decreases further after its exposure to air. It is important to note that the highest moisture reduction is achieved by the natural process of biodrying that contributes to an overall weight loss of 25-30%. The monitoring process is detailed in our answer to question #3.

3. Please confirm the production frequency of the final product (daily or every x days). What are the measures to ensure consistency/homogeneity *of the final product* on a day-to-day and/*or* batch to batch basis? How does Entsorga intend to monitor *the moisture, ash and chlorine content and the chlorine to sulfur ratio of the final product*? The Monitoring and Analysis Plan submitted to EPA on 3/15/2013 appears to be a generic plan with weekly sampling frequencies and analysis frequencies ranging from weekly to four monthly.

   - The plant we are considering to build in Martinsburg WV has a capacity of 100,000 t/y thus generating about 40,000 t/y equal to 180 t/day of Solid Recovered Fuel (SRF) that will produce 6 dd/w for roughly 12 hh/d.

     For the purpose of SRF analysis the production batch is the weekly production 180 t/d *6 d =1080 t. In order to analyze the production batch 24 increments (4 increments a day) are taken over the week. The increment size is about 1 kg and all increments will be mixed and homogenized to create the weekly composite sample. The composite sample, by quartering, will be selected a WEEKLY FINAL sample of 5-7kg (more or less 25 liters) to be analyzed by the laboratory. At that time all the items listed above: moisture, ash and chlorine content and the chlorine to sulfur ratio of the final product will be monitored. If there are issues, changes will be made to ensure consistency and that it meets EPA's desired regulations.

In-Flight Sorting

NATIONAL RECOVERY
TECHNOLOGIES LLC

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Nashville, TN 37210-3636
(615) 734-6400
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November 12, 2013

Mr. Barnes Johnson
Director
Office of Resource Conservation and Recovery
U.S. Environmental Protection Agency
2 Potomac Yard
2733 South Crystal Drive – 6th Floor: MC 5301P
Arlington, VA 22202-3553

Dear Director Johnson:

I am the Chief Executive Officer for National Recovery Technologies (NRT). I have more than 15 years of executive leadership experience in the material handling and capital equipment industries. We plan to contract with Entsorga for their proposed facility in Martinsburg, WV. The purpose of this letter is to detail the experience and success of the NRT near-infrared technology in extracting material which contains PVC.

Located in Nashville, Tennessee, NRT is a global leader in designing, manufacturing and installing optical sorting technology. Since our inception in 1981, we have applied our technology in automated industrial inspection systems, materials handling and process control, particularly in processing material for recycling. NRT is at the forefront of high speed optical sorting of waste materials using NIR spectroscopy.

Entsorga plans on utilizing our NRT SpydIR® Optical Sorter – considered to be a top of the line NIR sorter. The SpydIR® sorting system uses proprietary infrared sensing technology and fast highly sensitive algorithms to rapidly identify unique "signatures" of polymers from their infrared spectra. Operator selected polymers are precisely separated at high efficiency and low product loss by NRT's proven mass sort system. The NRT SpydIR® Optical Sorters detect and eject 99% by weight of all non-black PVC materials from a waste stream that are four square inches or larger when installed, operated, and maintained according to NRT recommended procedures. Feed stream materials are to be evenly distributed in a single layer across the width of an accelerating conveyor belt surface without overlapping, settled on the belt, and moving at a conveying speed of approximately 600 ft/min. Information on this technology and the NRT SpydIR® is enclosed.

Additionally, since most PVC is contained in piping, the amount of PVC and chlorine which is part of a typical municipal solid waste stream is significantly less than that of a construction and demolition stream. We recently ran a test at one of our NIR optical sorter systems and it showed that there was only .17% chlorine content remaining. This has clearly shown us that a facility with the Entsorga's proposed plant configuration can easily meet a .3% chlorine threshold.

In the United States, our company has NRT SpydIR® Optical Sorter customers located in California, Nevada, Utah, Texas, Illinois, Georgia, Alabama, New Mexico, Oklahoma, Arkansas, Wisconsin, Ohio, North Carolina, South Carolina, Minnesota, Iowa, Michigan, and Delaware. Each of these facilities utilize our NIR technology to separate PVC material from their waste streams. We also employ NRT SpydIR® Optical Sorters around the world.

Thank you for your time and consideration. I hope this letter speaks to the efficiency and experience we have in NIR technology.

Sincerely,
Matthias W. Erdmannsdoerfer

Matthias W. Erdmannsdoerfer
CEO

Enclosures

NIR Spectroscopy for PVC Removal
NRT SpydIR® Product Brochure

NATIONAL RECOVERY
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NIR Spectroscopy for PVC Removal

Vibrational spectroscopy is a versatile tool for determining the molecular structure of a material. There are three vibrational spectroscopy techniques that are commonly used: near-infrared (NIR), mid-infrared (MIR), and Raman. The particular spectroscopic method utilized is dependent upon the application. Of particular interest for process analysis (including material identification in waste streams) is NIR due to the relatively low cost, robust components commercially available.

Molecules are not static systems. Depending upon the type of atomic bonds there are various modes of movement between the atoms in the molecules. For NIR spectroscopy we are primarily concerned with vibrations between the atoms. The energy level for a given molecule will be quantized, meaning that only specific energy levels are allowed. NIR spectroscopy is based upon the overtones and combination vibrations of C-H, O-H, and N-H bonds which occur in the spectral region beginning just beyond visible light (750 nm) and stretching out to about 2500 nm. Fundamental absorption in the MIR occurs when bond energy is excited to the first excited energy level. This provides the strongest absorption of energy but is less penetrative than NIR radiation. Overtones are the result of energy jumping from the ground state to the second and higher excited energy states. While such transitions are less likely they still provide adequate signal level for identification of most organic materials. Combination spectral information arises from the interaction of two or more simultaneous molecular vibrations. NIR spectra tend to have more broadband information than MIR spectra since there are combinations of many different overtones/combinations represented.

Figure 1 is a spectral plot for some common polymers. Notice that each polymer has distinctive characteristics. These characteristics are the results of the vibrational overtones and combinations and provide a good foundation for identification and sortation. Note that these characteristics will also be distinct from other materials in the waste to energy stream. Some materials, such as polymers with carbon black which has a broadband absorption over the entire NIR region, may not provide adequate signal level for identification in this region.

Integration of NIR spectrometer systems with appropriate lighting, inexpensive glass optics, high speed data acquisition and computational systems, and precision ejection systems allows for the creation of highly accurate optical sorting equipment. NRT is at the forefront of high speed optical sorting of waste materials using NIR spectroscopy. The NRT SpydIR® Optical Sorters utilize NIR spectroscopic information to detect and eject 99% by weight of all non-black PVC materials from a waste stream when installed, operated, and maintained according to NRT recommended procedures. The standard NRT SpydIR® can identify and eject materials that are four square inches or larger. Smaller materials require the NRT SpydIR® HR (high resolution) optical sorter which is capable of detecting and ejecting materials as small as 0.1 square inches. Feed stream materials are to be evenly distributed in a single layer across the width of an accelerating conveyor belt surface without overlapping, settled on the belt, and moving at a conveying speed of approximately 600 ft/min.

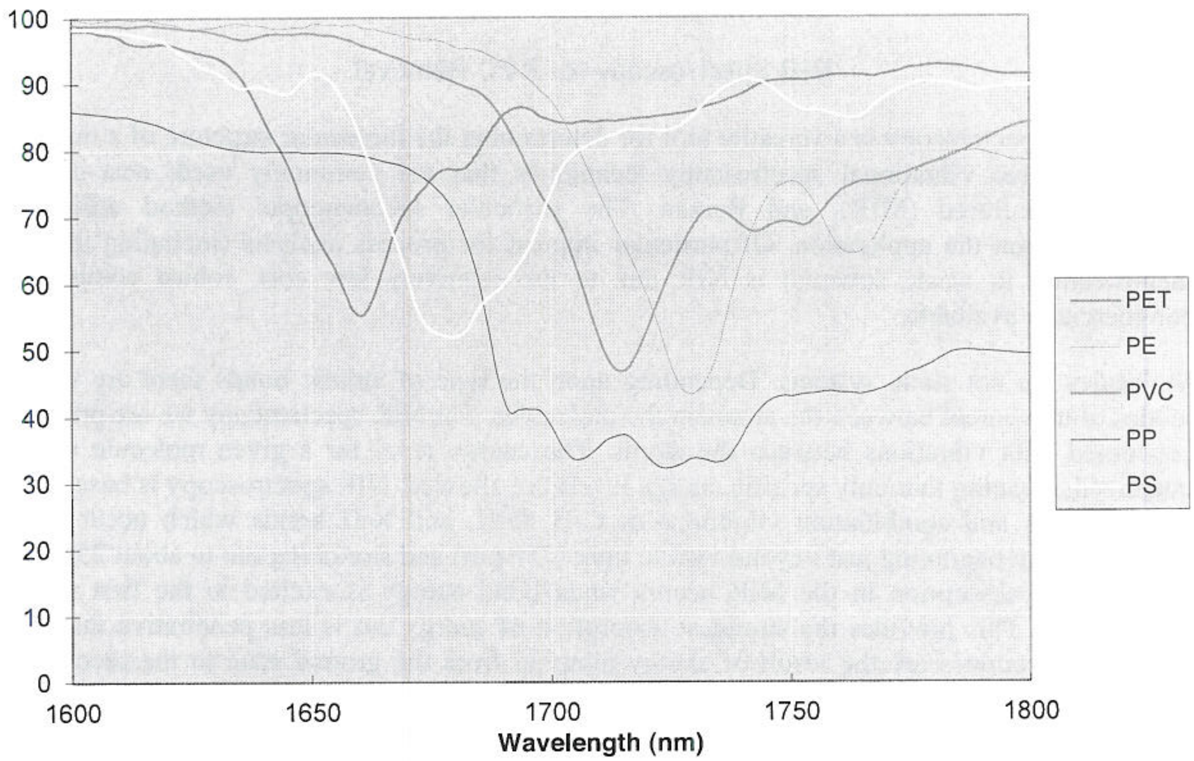
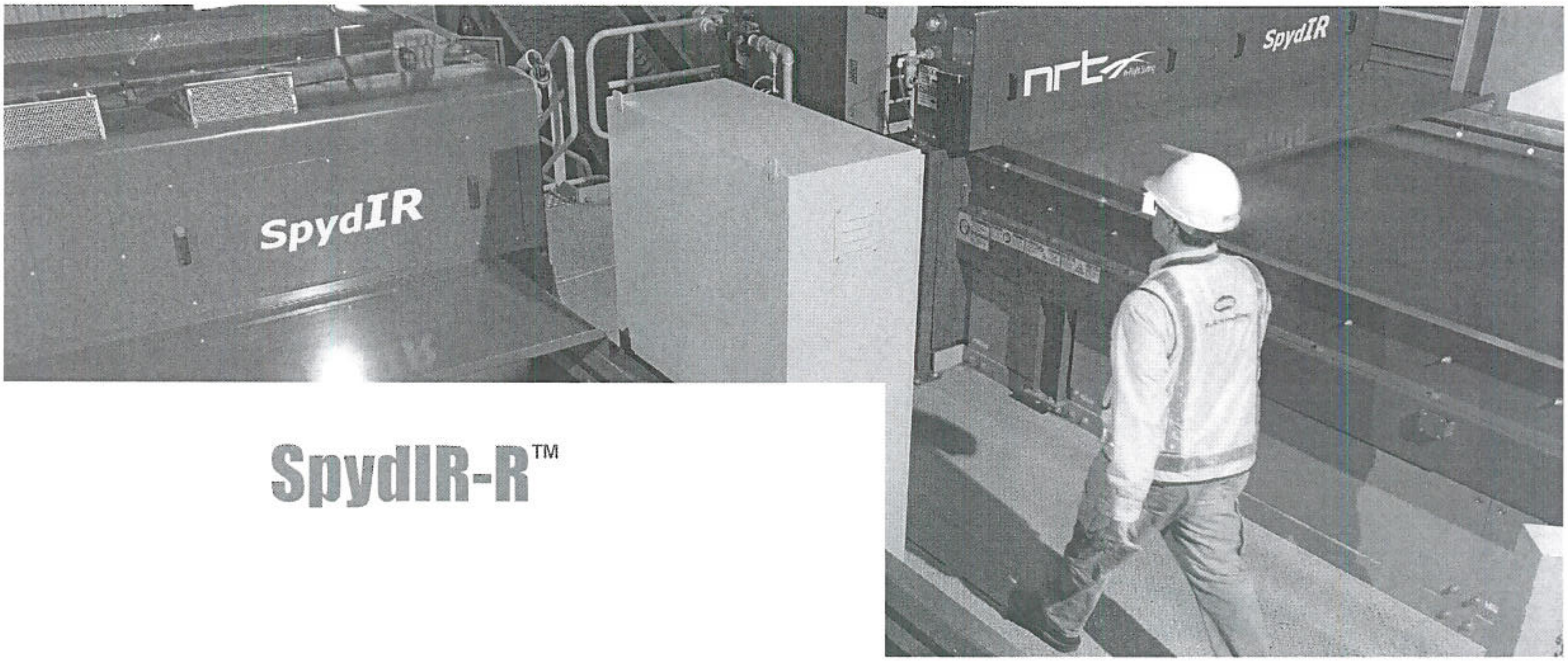


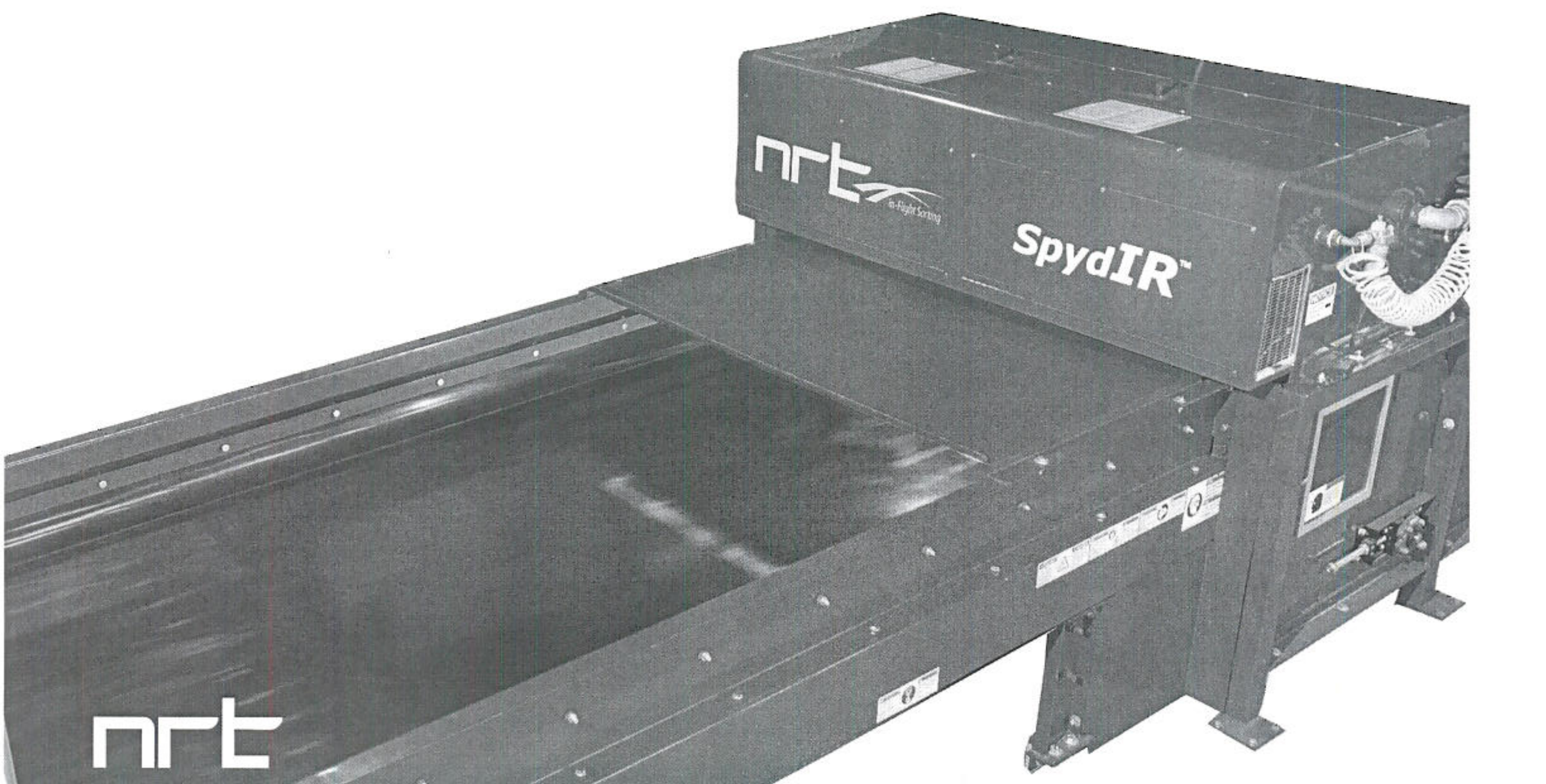
Figure 1: NIR Spectral Data



SpydIR-R™

IR In-Flight Sorting

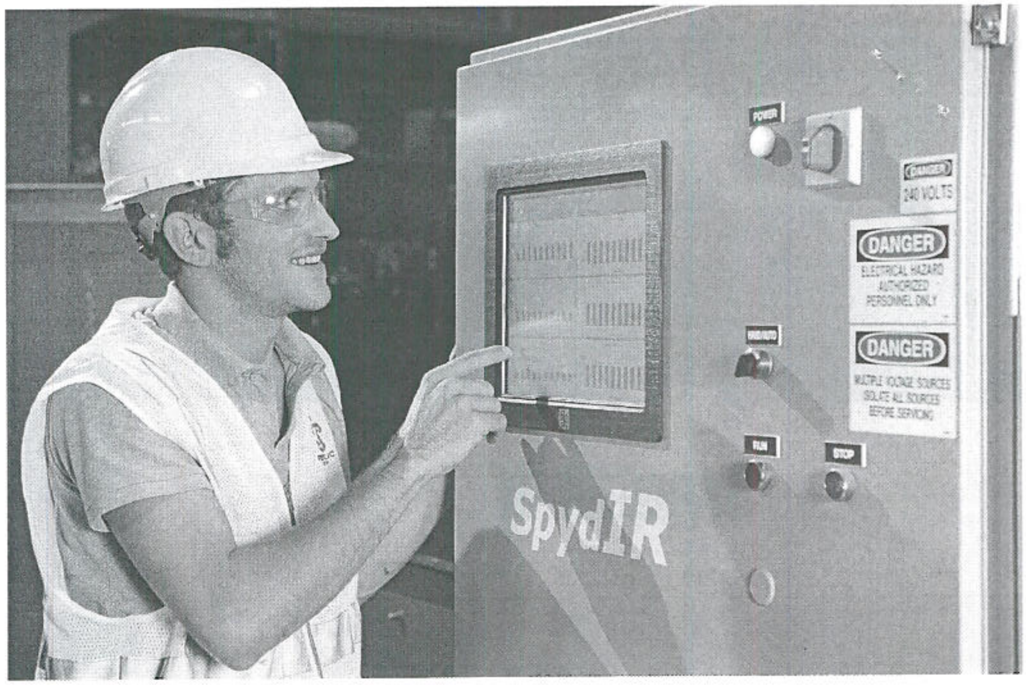
Overview **The SpydIR-R™ is an advanced infrared sorting system that separates numerous selected polymers from a mixed stream.** It uses proprietary technology and fast, highly sensitive algorithms to rapidly identify unique polymer signatures from their infrared spectra. This advanced technology is available in two models: the SpydIR-R™, which uses reflective detection, and the SpydIR-T™, which utilizes transmissive detection. While other optical sorters detect material over the belt and eject some time later, NRT offers In-Flight Sorting, which detects and ejects material in flight. In-Flight Sorting enables the use of transmissive detection and eliminates motion-related error and belt interference, increasing purity levels and hit rates.



nrt

SpydIR-R™

IR In-Flight Sorting



Technology	NIR identification of multiple polymer types
	Proprietary infrared sensing technology and algorithms for rapid detection
	Self-cleaning infrared sensing system
	Operator-friendly color touch-screen graphic control panel
Applications	Sorts 1-7 plastics in any combination
	Single sort high-purity clear and light blue PET directly from container stream
	Separate WEEE plastics into user-defined polymer groups
	Recover clean PET product from polymer residue streams for return to main PET stream
	Remove polymer contaminants from a PET container stream with high accuracy, including PVC, PS, PETG, PLA, PC, PE, PP and other polymers in any combination
	Recover wood product from C&D streams
	Sort Tetra Pak®, aseptic and PE coated gabled products from a container stream
	Remove cardboard, paper, and other fiber from a container stream
Features	In-Flight Sorting provides unbeatable purity and hit rates
	Industry leading signal-to-noise ratio is ideal for thin-wall PET
	High speed identification with throughput rates exceeding 16,000 lb/hr
	Remote diagnostics, adjustments and upgrades
	Width sizes from 24" to 120"

nrt National Recovery Technologies 1508 ELM HILL PIKE · NASHVILLE, TN 37210 · 1.615.734.6400 · A BHS COMPANY · nrtsorters.com